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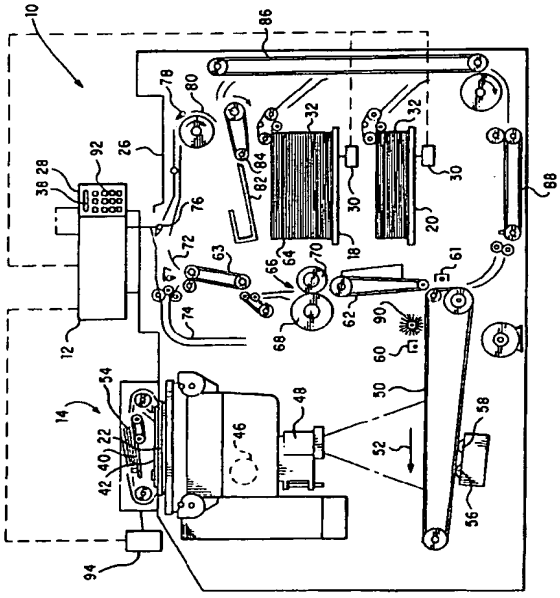
(54) Paper capacity indication system.

(57) A control system for a reproduction device (10) which reproduces an image on one or more sheets controls reproduction of a print job according to the quantity of copy sheets (64) in a supply source (18) as compared to the quantity of original sheets (42) in the print job and the quantity of copies to be made. The user is signalled as to the sufficiency of sheets in the supply source for completing the job so as to avoid interruption of the print job. Only when there is a sufficient quantity of sheets in the supply source will the reproduction automatically commence.

FIG. 1



EP 0 620 503 A2

This invention relates to a reproduction system for reproducing an image from an original document, and to a method for determining the sufficiency of copy sheets in the paper supply source of such a system to complete a print job before the print job commences.

Many reproduction systems which reproduce an image on a plurality of sheets are equipped with a document handler and a controller to instruct the document handler when to feed an original from a set of originals for imaging on a platen in an effort to expedite reproduction of large print jobs. See, for example, U.S. Patent No. 5,130,750 which discloses a copier with a document handler and a controller that counts and compares the number of originals with respect to the number of copies made. During processing, this information is utilized to keep track of the respective originals and the copy sheets. The problem in the '750 patent is that the document handler automatically begins to copy without regard to the sufficiency of sheets in the paper supply source to complete the print job. Therefore, the print job being processed in accordance with the '750 patent automatically halts when the paper supply is empty causing delay and inefficiency for a user.

The success and the efficiency of the document handler in current printing systems is severely limited because the user is unable to determine before beginning the print job whether the amount of paper in the copy paper supply source is sufficient to complete the print job. Presently, the only way for a user to determine how many sheets of copy paper are in the supply source would be for the user to manually count the sheets contained in the supply source. If the user begins a job when there is insufficient paper in the supply source to complete a job, the reproduction device will stop at whatever point in the job that the paper supply is depleted. In this case, the user must reload paper into the supply source and restart the job. This interruption results in delay and inefficiency due to down time while the machine sits idle until the user replenishes the supply source. A job interruption is an inconvenience for the user, causes delay in production and is inefficient. The user may also have to determine where the job was interrupted and ensure that all of the originals were copied.

While the related art recognizes controlling a print job during processing, a system is needed that controls printing before the print job commences to enable the above-described interruptions to be avoided.

A reproduction system in accordance with the present invention has a control system which compares print job data with the quantity of copy paper sheets in a supply source before beginning processing of the print job. Then, the control device sends a signal to the user to indicate the sufficiency of sheets in the copy paper supply source for completing the instant print job before beginning the print job.

The present invention provides a reproduction system, and a method for determining a sufficiency of copy sheets in a reproduction system, as claimed in the accompanying claims.

The present invention also provides a reproduction system for reproducing an image from an original document, comprising an input inputting print data, including a quantity of copies to be made; a reproducer reproducing the image on at least one copy sheet corresponding to the input print data; a supply source coupled to said reproducer and supplying at least one copy sheet to said reproducer; a supply determiner coupled to said supply source determining a quantity of copy sheets in said supply source; and a controller coupled to said input, said supply determiner and said reproducer, wherein said controller compares the input print data and the quantity of copy sheets in said supply source and controls reproduction based on the comparison.

The present invention further provides a reproduction system for reproducing an image from an original document comprising a loading tray receiving an original document comprising at least one original sheet; an input inputting print data, including a quantity of copies to be made; a supply source containing a quantity of copy sheets; a supply determiner coupled to said supply source which determines data corresponding to the quantity of copy sheets in said supply means; a reproduction mechanism coupled to said supply source and reproducing the original document on copy sheets based on the input print data; a controller coupled to said input, said supply determiner and said reproduction mechanism, wherein said controller controls reproduction of the original document in accordance with a comparison of the input print data and the quantity of copy sheets in said supply source and outputs a signal based on the comparison; and a display coupled to said controller and receiving the output signal, wherein said display displays a message corresponding to the output signal.

By way of example only, embodiments of the invention will be described with reference to the accompanying drawings in which like reference numerals refer to like elements and wherein:

Figure 1 is a schematic side view illustrating the principal mechanical components of a reproduction system in accordance with the present invention;

Figure 2 is a schematic diagram depicting one embodiment of the present invention; and

Figure 3 is a schematic diagram depicting another embodiment of the present invention.

The Reproduction System

The present invention is described for use in a copier for purposes of explanation only since it can be

employed in any type of reproduction device, including but not limited to ink jet printers, ionographic printers, dot matrix printers or laser printers. Referring to Fig. 1, an exemplary reproduction or copy machine 10 for processing print jobs includes a controller 12 and a recirculating document handling system 14. The document handling system 14 includes an original holding tray 40 which receives a document 54, generally comprising a plurality of original sheets 42, for reproduction. A counter 94 is coupled to document handling system 14 to count the number of original sheets in the document to be copied. Counter 94 may be any conventional counting device such as a shuffling mechanism.

In as much as the art of copying is well known, the operation of the various processing stations employed will be described briefly. Handling system 14 advances original sheet 42 facedown onto a transparent platen 22. A belt 50 having a photoconductive surface moves in the direction of an arrow 52 to advance successive portions of the photoconductive surface through various processing stations, starting with a charging station including a corona generating device 60. Corona generating device 60 charges the photoconductive surface of belt 50 to a relatively high substantially uniform potential.

The charged portion of the photoconductive surface of belt 50 is then advanced through an imaging station. At the imaging station, recirculating document handling system 14 positions original sheet 42 face down. A lamp 46 flashes light rays onto original sheet 42. The light rays reflected from original sheet 42 are transmitted through a lens 48 forming a light image thereof. Lens 48 focuses the light image onto the charged portion of the photoconductive surface of belt 50 to selectively dissipate the charge thereon. This records an electrostatic image on the photoconductive surface of belt 50 which corresponds to the informational areas contained within original sheet 42. Although the illustrated embodiment is used for imaging a document, it is understood that the present invention can be used in copy machines which use other arrangements for imaging a document.

Document handling system 14 sequentially feeds the plurality of sheets 42 in document 54 from original holding tray 40, in seriatim, to platen 22. Document handling system 14 recirculates the plurality of original sheets 42 back to original holding tray 40.

At the development station a pair of magnetic brush developer rollers 56 and 58 advance a developer material into contact with the electrostatic latent image. The latent image attracts toner particles from the carrier granules of the developer material to form a toner powder image on the photoconductive surface of belt 50. Other arrangements of applying toner onto belt 50 are, of course, possible.

After the electrostatic latent image recorded on the photoconductive surface of belt 50 is developed, belt 50 advances the toner powder image to the transfer station. At the transfer station a copy sheet 64 is moved into contact with the toner powder image. The transfer station includes corona generating device 61 which sprays ions onto the backside of copy sheet 64. This attracts the toner powder image from the photoconductive surface of belt 50 to copy sheet 64.

Copy sheet 64 is fed from a selected one of a copy paper supply tray 18 or 20 to the transfer station. One of copy paper supply trays 18 or 20 can contain a special type of copy sheet (i.e., cover sheets), or an additional tray (not shown) for holding a special type of sheets can be provided. Each copy paper supply tray 18 and 20 has a measuring device 30 coupled thereto for determining the number of copy sheets in supply tray 18 and 20 as described later. As shown in Fig. 2, measuring device 30 is a linear velocity displacement transducer 36 coupled to a side of tray 18, for example, for measuring the height of the stack of copy sheets 64. The embodiment of Fig. 3 shows measuring device 30 as a load cell 34 coupled to the bottom of tray 20, for example, for measuring the weight of the stack of copy sheets 64.

After transfer, a conveyor 62 advances copy sheet 64 to a fusing station. The fusing station includes a fuser assembly for permanently affixing the transferred powder image to copy sheet 64. Preferably, a fuser assembly 66 includes a heated fuser roller 68 and a backup roller 70 with copy sheet 64 passing between fuser roller 68 and backup roller 70 with the powder image contacting fuser roller 68.

After fusing, conveyor 63 transports copy sheet 64 to a gate 72 which functions as an inverter selector. Depending upon the position of gate 72, copy sheet 64 will either be deflected into a sheet inverter 74 or fed directly onto a second gate 76. Gate 76 deflects copy sheet 64 into a transport path which carries it on without inversion to a third gate 78. Gate 78 either passes the sheets directly on without inversion into the output path of the copier to an output tray 26, or deflects the sheets into a duplex inverter roll transport 80. Inverting transport 80 inverts and stacks a plurality of copy sheets 64 to be duplexed in a duplex tray 82. Duplex tray 82 provides intermediate or buffer storage for those sheets which have been printed on one side for printing on the opposite side.

In order to complete duplex copying, the previously simplexed copy sheet 64 in tray 82 is fed by a bottom feeder 84 back to the transfer station for transfer of the toner powder image to the opposite side of copy sheet 64. Conveyers 86 and 88 advance a duplex copy sheet along a path which produces an inversion of the duplex copy sheet. The duplex copy sheet is then fed through the same path as the previously simplexed copy sheet 64 to be stacked in output tray 26 for subsequent removal by the printing machine operator.

Invariably, after copy sheet 64 is separated from

the photoconductive surface of belt 50, some residual particles remain adhering to belt 50. These residual particles are removed from the photoconductive surface thereof at a cleaning station. The cleaning station includes a rotatably mounted fibrous brush 90 in contact with the photoconductive surface of belt 50.

A user interface 28 includes a keypad 92 and a display area 38. Display area 38 is preferably a liquid crystal display (LCD). In another embodiment, display area 38 is merely a lighted signal, for example, a light emitting diode (LED). User interface 28 is described as having the particular form shown in the illustrated embodiment, but it is understood that copy machines may have a variety of user interfaces including, for example, a main frame computer.

The Control System

The reproduction and document handling operations are preferably controlled by controller 12. Controller 12 is generally a conventional programmable controller such as shown in U.S. Patent No. 5,130,750. In this case, however, controller 12 is additionally programmed with functions described herein for scheduling and controlling the determinations regarding the sufficiency of copy sheets for completing the input print job which take place before the reproduction process begins and which integrate the use of measuring device 30 and optionally of counter 94.

As seen in Figure 1, controller 12 is in communication with counter 94 which is coupled to document handler 14. Counter 94 counts the plurality of original sheets 42 in document 54 and outputs the result to controller 12. Counter 94 is an optional component and may be replaced by manually inputting the number of original sheets 42 in document 54 at user interface 28. Controller 12 communicates with the user interface 28 to receive input print data. As well, the controller 12 communicates with measuring device 30 which, in turn, is coupled to at least one copy paper supply tray 18 and 20.

In the illustrative embodiment, the print job includes a plurality of original sheets 42 in a document 54 for which multiple copies are to be made. In operation, the number of copies of the original document 54 to be reproduced is input at keypad 92 on user interface 28. The quantity of original sheets 42 in document 54 is also input either manually at keypad 92 on user interface 28 or via counter 94 on document handling system 14 which automatically counts the quantity of original sheets 42 in document 54. In the case in which the number of original sheets in the document is automatically counted, controller 12 activates counter 94 to shuffle or scroll through the original sheets 42 of document 54 for the print job to determine the quantity of original sheets 42. Alternatively, the number of original sheets can be preprogrammed or electronically sent to copy machine 10 from a mainframe computer.

As discussed above, copy paper supply source 32 includes copy paper holding trays 18 and 20 which are coupled with a measuring device 30 and controller 12 to determine the quantity of copy sheets 64 in copy paper supply source 32. In the embodiment shown in Fig. 2, the quantity of copy sheets in copy paper supply source 32 is determined from measuring device 30 which is in the form of a linear velocity displacement transducer 36. Linear velocity displacement transducer 36 measures the height or thickness of a stack of copy sheets. Linear velocity displacement transducer 36 outputs the height measurement to controller 12. The embodiment shown in Fig. 3 uses a measuring device 30 in the form of a load cell 34 to measure the weight of a stack of copy sheets 64 in supply source 32. Load cell 34 outputs the weight data to controller 12 to determine the quantity of copy sheets 64 in copy paper supply source 32. Controller 12 is programmable to accommodate different types of paper having different weights. Preferably, paper having a weight of 20 pounds per 1,000 sheets is used.

Controller 12 includes conventional software to convert the measurement data output from measuring device 30 to data corresponding to the number of copy sheets 64 in supply source 32 and to compare the copy sheet data to the input data from user interface 28 and input data from counter 94 if applicable, corresponding to the number of copies to be made and the number of original sheets 42. Controller 12 is coupled with user interface 28, measuring device 30 and counter 94 via conventional circuit paths which transfer data.

After controller 12 completes the conversion and comparison of measured data and input data, a signal is output to display 38. Display 38, located on user interface 28, shows a message indicating the ability for uninterrupted completion of a print job. The message reflects the result of the comparison from control device 12. In one embodiment, display 38 shows a message indicating to the user the insufficiency of the quantity of copy sheets in copy paper supply source 32 to satisfy a print job and directs the user to replenish copy paper supply source 32 prior to commencing the print job. Display 38 includes, for example, one message for indicating a sufficient supply of copy sheets and another message for indicating an insufficient supply of copy sheets. The message may merely constitute a colored light.

The following is an illustration of an actual operation of controller 12 in the preferred embodiment of the invention. The total number of copies to be reproduced in a print job is input into keypad 92 on user interface 28. The quantity of original sheets 42 in document 54 loaded into document handler 14 for the print job is automatically counted by counter 94. Print data,

including the number of copies input at user interface 28 and the number of original sheets counted by counter 94, is output to controller 12. Then before commencing processing of the print job, controller 12 activates measuring device 30 which measures the number of copy sheets 64 in copy paper supply source 32. The measurement result is output to controller 12. From this measurement the quantity of copy sheets 64 in copy paper supply source 32 is determined by controller 12 using conventional algorithms. Controller 12 then compares the print job data, including the number of original sheets 42 in document 54 and the number of copies to be made, to the number of copy sheets 64 in copy paper supply source 32 to determine if there is a sufficient quantity of copy sheets 64 in copy paper supply source 32 to satisfy the quantity of copy sheets needed to complete the print job. The user is then signalled to add more copy sheets 64 to copy paper supply source 32 if necessary. If the comparison shows that there is a sufficient amount of copy sheets 64 in copy paper supply source 32, the print job will automatically begin.

Claims

1. A reproduction system for reproducing an image from an original document, comprising:

   input means (28) for inputting print data, including a quantity of copies to be made;

   reproduction means for reproducing the image on at least one copy sheet based on the input print data;

   supply means (18) for supplying at least one copy sheet to said reproduction means;

   supply determination means (30) coupled to said supply means for determining a quantity of copy sheets in said supply means; and

   control means (12) for controlling reproduction based on the input print data and the quantity of copy sheets determined by said supply determination means, said control means being coupled to said input means, said supply determination means and said reproduction means.

2. A reproduction system according to claim 1, wherein the input print data includes a quantity of original sheets in the original document.

3. A reproduction system according to claim 1 or claim 2, further comprising a holding means (14) for loading the original document, and a counting means (94) for counting a quantity of sheets in the original document loaded in said holding means, said counting means being coupled to said holding means and in communication with said control means.

4. A reproduction system according to any one of claims 1 to 3, wherein said supply determination means is a linear velocity displacement transducer (36) which measures a height of the at least one copy sheet in said supply means.

5. A reproduction system according to any one of claims 1 to 3, wherein said supply determination means is a load cell (34) which measures a weight of the at least one copy sheet in said supply means.

6. A reproduction system according to any one of the preceding claims, wherein said control means includes a comparison means for comparing the input print data and the quantity of copy sheets in said supply means to determine whether the quantity of copy sheets in said supply means is sufficient to complete a print job based on the input print data.

7. A reproduction system according to claim 6, further comprising a display means (38) for displaying a result of the comparison from said comparison means.

8. A method for determining a sufficiency of copy sheets in a supply source of a reproduction system for reproducing an original image from a document on at least one copy sheet, comprising the steps of:

   inputting input data comprising a quantity of copies to be reproduced and a quantity of original sheets in the document;

   determining a quantity of copy sheets in said supply source;

   comparing said input data to said quantity of copy sheets in the supply source to determine the sufficiency of copy sheets in the supply source to complete a print job based on the input data; and

   displaying a message which indicates the sufficiency of copy sheets in the supply source to complete a print job based on the input data and the quantity of copy sheets in the supply source.

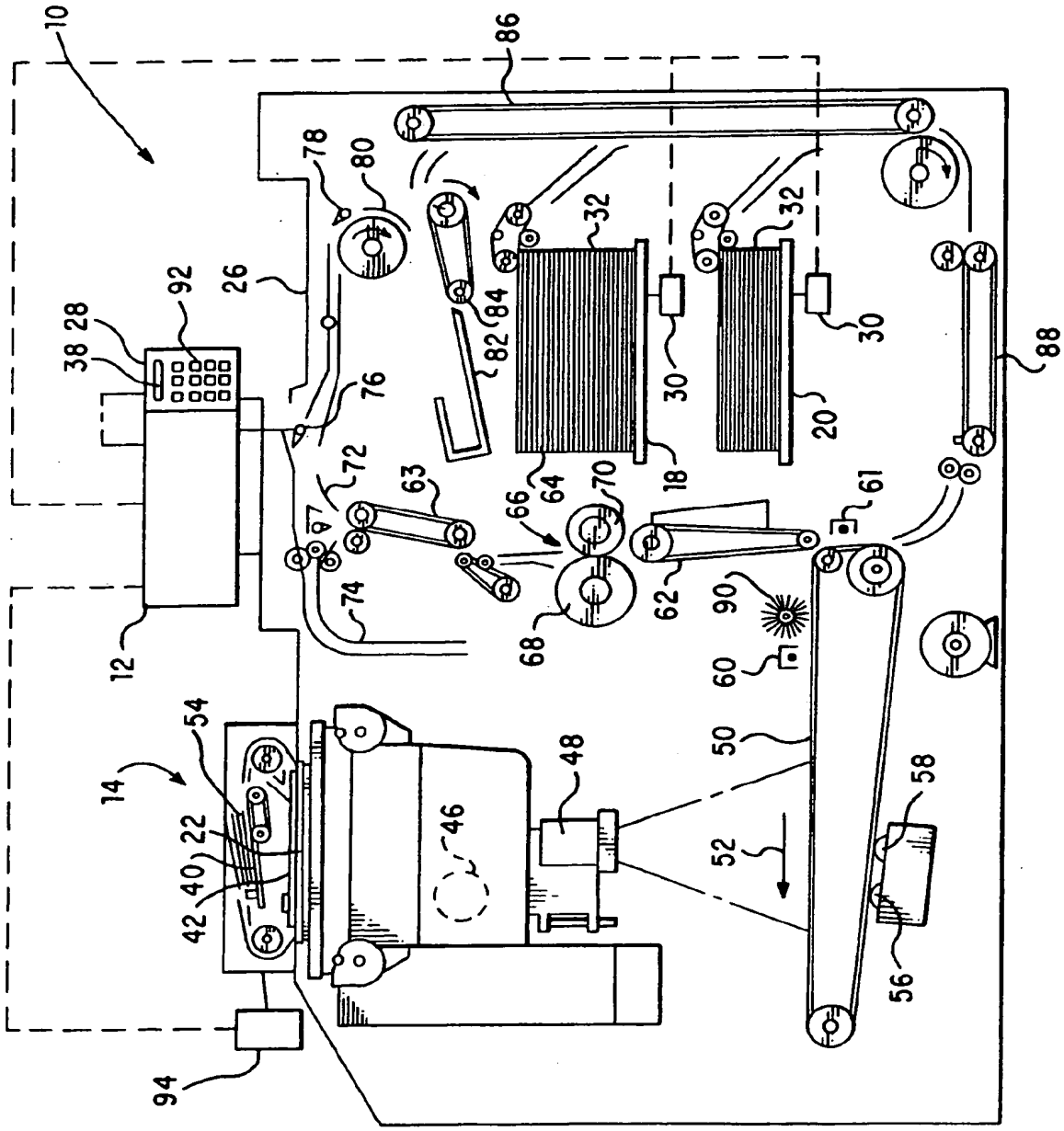
9. A method according to claim 8, further comprising the step of automatically commencing reproduction of the image when there is a sufficient supply of copy sheets.

10. A method according to claim 8 or claim 9, further comprising the step of weighing the quantity of copy sheets in the supply source with a load cell to determine the quantity of copy sheets in the supply source.

11. A method according to claim 8 or claim 9, further

comprising the step of measuring a height of the quantity of copy sheets in the supply source with a linear velocity displacement transducer to determine the quantity of sheets in the supply source.

FIG. 1



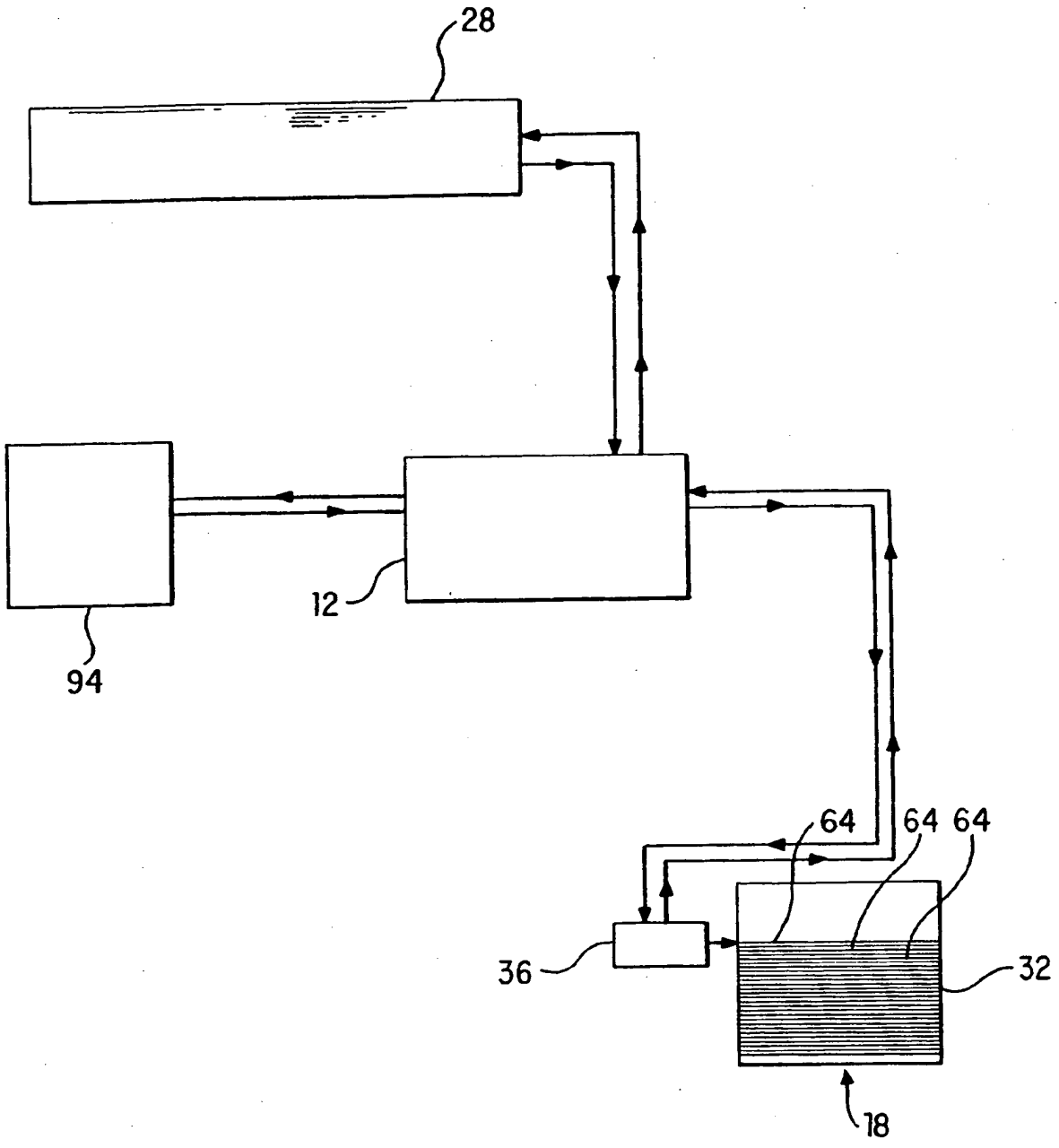


FIG. 2

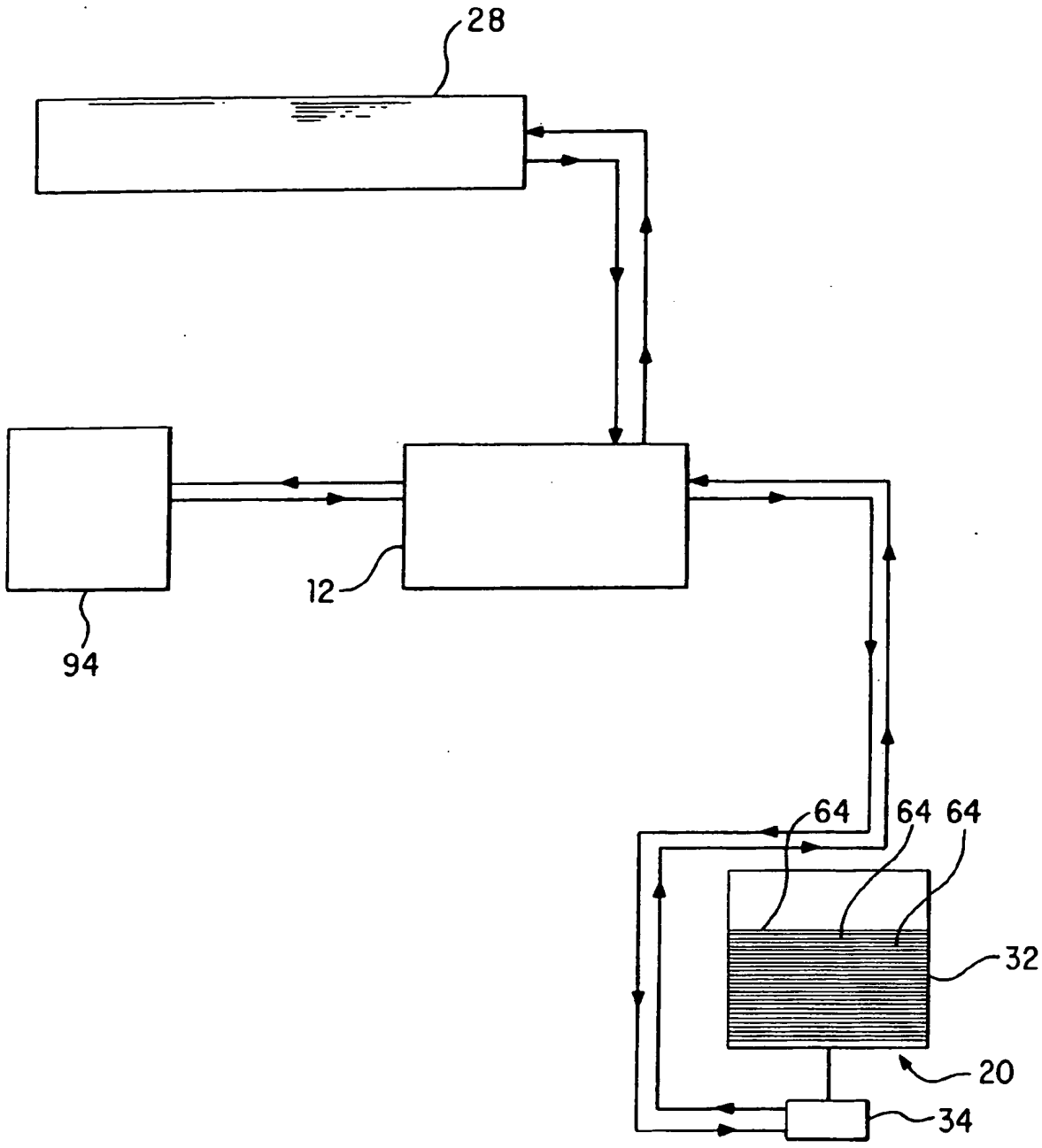


FIG. 3

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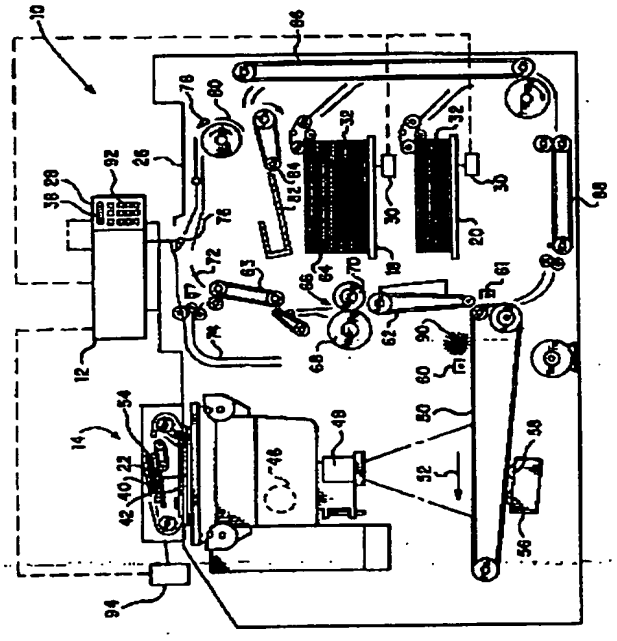
(54) Paper capacity indication system.

(57) A control system for a reproduction device (10) which reproduces an image on one or more sheets controls reproduction of a print job according to the quantity of copy sheets (64) in a supply source (18) as compared to the quantity of original sheets (42) in the print job and the quantity of copies to be made. The user is signalled as to the sufficiency of sheets in the supply source for completing the job so as to avoid interruption of the print job. Only when there is a sufficient quantity of sheets in the supply source will the reproduction automatically commence.

FIG. 1



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EUROPEAN SEARCH REPORT

Application Number
EP 94 30 2466

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X	US-A-4 734 747 (OKUDA MASAKIYO ET AL) 29 March 1988 * column 1, line 65 - column 2, line 26; figures 1,2 *	1-3,6-9	G03G15/00
Y		4,5,10, 11	
Y	US-A-4 748 479 (OHIRA TADASHI ET AL) 31 May 1988 * column 7, line 11 - line 17 * * column 9, line 65 - column 10, line 8 *	4,11	
Y	US-A-3 806 242 (REEHIL E) 23 April 1974 * column 5, line 47 - line 52 *	5,10	
			TECHNICAL FIELDS SEARCHED (Int.Cl.5) G03G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	28 September 1994	Trepp, E

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